

EXHIBIT 2

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:

Shinta MIYAZUMI et al.

Group Art Unit: 4151

Serial Number: 10/576,073

Examiner: Angela Ortiz

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For: PROCESS FOR PREPARING MULTILAYER STRUCTURE PRODUCT

DECLARATION UNDER 37 CFR 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

Kaoru INOUE, citizen of Japan, duly deposes and says:

1. That he has graduated from Faculty of Osaka City University of , Japan, in the year of 1992;
2. That he has been employed in his capacity since 1992 by The Nippon Synthetic Chemical Industry Co., Ltd.
3. That he has been engaged in research and development on a process for preparing multilayer structure product;

EXPERIMENTAL

(1) EXAMPLE 1

Six layers blow molding machine with four extruders was charged with EVOH [ethylene in an amount of 32% by mol, a degree of saponification of 99.5% by mol, MFR of 12 g/10 min (210.degree. C., load of 2160 g), a boron compound in an amount of 380 ppm by boron conversion, magnesium acetate in an amount of 180 ppm by magnesium conversion, melt-viscosity ratio of 6], HDPE [high-density polyethylene, "NOVATEC HD HB431" available from Japan Polychem Corporation], and an adhesive resin (maleic anhydride modified high-density polyethylene, "MODIC AP F501" available from Mitsubishi Chemical Corporation), and six layers bottles with four kinds of resin having a layer structure of an HDPE layer/a recovering layer/an adhesive resin layer/an EVOH layer/an adhesive resin layer/an HDPE layer ordered from the outer layer (a thickness at the middle was 70 .mu.m/210 .mu.m/20 .mu.m/100 .mu.m/20 .mu.m/290 .mu.m, a capacity is 500 cc) were molded for 8 hours.

In the blow molding at that time, an extruder for each layer was a single screw extruder having 30 mm.phi. equipped with a downward circular die having 21 mm.phi., in which a resin capacity in the die was 140 cm.sup.3, was used. A ratio of an amount of a recovered resin to virgin HDPE was adjusted to be 1% of an EVOH amount in the recovering layer. Further, a set temperature in an processing machine for each layer was all set at 210C., and a temperature in a die was also set at 210.degree. C.

After molding for 8 hours, the machine was left to be stood at the set temperature as it was for 8 hours. The resin discharged from the die at this time was 10% of the die volume. The molding is restarted after that, it became possible to mold into a shape of a bottle after 2 minutes

from initiating flowing a resin, and after further 15 minutes, streaks disappeared and a bottle having excellent appearance was able to be obtained.

As for the obtained 10 bottles, they were filled with 450 cc of water and capped, then dropped from the height of 1 m to a concrete floor 50 times, positioning the bottoms of the bottles parallel to the floor at a room temperature. The number of broken bottles was counted (impact resistance at dropping).

(2) EXAMPLE 2

Example 2 was carried out in the same manner as Example 1, except for setting a temperature to be left at 150.degree. C. and an amount of flowing resin was 4%, the molding was restarted, it became possible to mold into a shape of a bottle after 2 minutes from initiating flowing a resin, and after further 11 minutes, streaks disappeared and a bottle having excellent appearance was able to be obtained. The evaluation for the obtained bottles was also carried out in the same manner.

(3) EXAMPLE 3

Example 3 was carried out in the same manner as Example 1, except for using EVOH having an ethylene content of 32% by mol, a degree of saponification of 99.5% by mol, MFR of 12 g/10 min (210.degree. C., load of 2160 g), an amount of a boron compound of 380 ppm by boron conversion, an amount of magnesium acetate of 250 ppm by magnesium conversion, the melt-viscosity ratio of 4 and setting an discharge amount of resin was 35%, then the molding was restarted, it became possible to mold into a shape of a bottle after 4 minutes from initiating flowing a resin, and after further 21 minutes, streaks disappeared and a bottle having excellent appearance was able to be obtained. The evaluation for the obtained bottles was also carried out in the same manner.

(4) EXAMPLE 4

The resin flow was suppressed by applying a plate to the lip part in the die after stopping. The discharge amount of resin at that time was 12%. The molding was restarted in the same manner, and it became possible to mold into a shape of a bottle after 2 minutes from initiating flowing a resin, and after further 15 minutes, streaks disappeared and a bottle having excellent appearance was able to be obtained. The evaluation for the obtained bottles was also carried out in the same manner.

(5) EXAMPLE 5

Example 5 was carried out in the same manner as Example 1, except that a processing temperature was set at 230.degree. C., stood to be left at the processing temperature, and an amount of flowing resin was 15%, then the molding was restarted, it became possible to mold into a shape of a bottle after 3 minutes from initiating flowing a resin, and after further 15 minutes, streaks disappeared and a bottle having excellent appearance was able to be obtained. The evaluation for the obtained bottles was also carried out in the same manner.

(6) EXAMPLE 6

Example 6 was carried out in the same manner as Example 1, except that a leaving time was 5 hours and an discharge amount of resin is 7%, the molding was restarted, it becomes possible to mold into a shape of a bottle after 2 minutes from initiating flowing a resin, and after further 10 minutes, streaks disappeared and a bottle having excellent appearance can be obtained. The evaluation for the obtained bottles was also carried out in the same manner.

(7) EXAMPLE 7

Example 7 was carried out in the same manner as Example 1, except for using EVOH having an ethylene content of 32% by mol, a degree of saponification of 99.5% by mol, MFR of 12 g/10 min (2

10.degree. C., load of 2160 g), an amount of magnesium acetate of 180 ppm by magnesium conversion, the melt-viscosity ratio of 2 and setting a discharge amount of resin of 35%, then the molding was restarted, it became possible to mold into a shape of a bottle after 5 minutes from initiating flowing a resin, and after further 20 minutes, streaks disappeared and a bottle having excellent appearance was able to be obtained. The evaluation for the obtained bottles was also carried out in the same manner.

(8) COMPARATIVE EXAMPLE 1

After purging an extruder in the EVOH layer before terminating with a commercially available polypropylene ("NOVATEC LD LF542H" available from Japan Polychem Corporation.) in Example 1, a temperature in the processing machine was lowered to a room temperature, EVOH was charged into the extruder in the EVOH layer, then restarting the molding, it was required to take 20 minutes to be able to mold into a shape of a bottle from initiating flowing a resin in the whole layers, and it further took 50 minutes to disappear the streaks and obtain a bottle having excellent appearance. The evaluation for the obtained bottles was also carried out in the same manner.

(9) COMPARATIVE EXAMPLE 2

Comparative Example 2 was carried out in the same manner as Example 1, except for setting a temperature in the die at being left after terminating the molding after terminating the molding at 230.degree. C., and the molding was restarted, it was required to take 7 minutes to be able to mold into a shape of a bottle from initiating flowing a resin, and it further took 30 minutes to disappear the streaks and obtain a bottle having excellent appearance. The evaluation for the obtained bottles was also carried out in the same manner.

(10) COMPARATIVE EXAMPLE 3

Comparative Example 3 was carried out in the same manner

as Example 1, except for setting a temperature in the die at being left after terminating the molding at 80.degree. C., then the molding was restarted, it was required to take 10 minutes to be able to mold into a shape of a bottle from initiating flowing a resin, and it further took 30 minutes to disappear the streaks and obtain a bottle having excellent appearance. The evaluation for the obtained bottles was also carried out in the same manner.

RESULTS AND DISCUSSION

The results obtained in the experiments described above are shown in Table 1 and 2.

Table. 1

	The whole amount of resin used for purging (g)
Example 1	3300
Example 2	3000
Example 3	5500
Example 4	3700
Example 5	4000
Example 6	2600
Example 7	5500
Comparative Example 1	16000
Comparative Example 2	9500
Comparative Example 3	9000

Table. 2

	The number of the broken bottles
Example 1	at most 1
Example 2	at most 1
Example 3	at most 1
Example 4	at most 1
Example 5	at most 1
Example 6	at most 1
Example 7	at most 1
Comparative Example 1	at least 4
Comparative Example 2	2 to 3
Comparative Example 3	2 to 3

As is apparent from the results shown in Table 1, the whole amount of resin used for purging of each Examples are specifically far less than the results of Comparative Examples. The whole amount of resin used for purging of Examples are 5500 at most, but the result of Comparative Examples are 9000 at least. As is apparent from the results shown in Table 2, the number of the broken bottles of each Examples are at most 1, but the result of Comparative Examples are 2 to 3 at least.

Thus, according to the present invention, it becomes possible to obtain a satisfactory molded article quickly after restarting the molding without using a special purging agent because the whole amount of resin used for purging becomes lower. In other words, it is possible to use same resin to purge when restart the molding. On the other hand, the results of Comparative Examples show that it is difficult

to purge by using same resin, if using the same resin by force, the whole amount of resin for purging becomes large quantity. That is, it is necessary to use a special purging agent. Further, EVOH remained in a molding machine is utilized as it is after initiating re-molding, even though a part thereof may be disposed, and the impact resistance of the obtained molded article is not lowered.

The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

This 10th day of December, 2008

by Kaoru Inoue
Kaoru INOUE

We, the undersigned witnesses, hereby acknowledge that Kaoru INOUE is personally known to us and did execute the foregoing Declaration in our presence on:

Date: December 10, 2008 Witness Minako Kajitani

Date: December 10, 2008 Witness Yoshiaki Horai